


CPUC, CEC, ARB Electricity & Natural Gas GHG Modeling

AB32 Economic Analysis Technical Stakeholder Working Group


January 28, 2008

 Energy and Environmental Economics, Inc.

*Sneller Price, Partner
Energy and Environmental Economics, Inc.
101 Montgomery Street, Suite 1600
San Francisco, CA 94104
415-391-5100*

Energy and Environmental Economics, Inc. (E3)


- San Francisco-based firm established in 1993
- Electric and natural gas utility sectors
- Practice areas
 - Energy efficiency and building standards
 - Distributed generation, demand response and CHP
 - Integrated resource planning
 - Transmission planning and pricing
 - Retail rate design

 Energy and Environmental Economics, Inc.

2

CPUC, CEC, ARB Project Team


- Energy and Environmental Economics, Inc.
 - Prime, Development of the non-proprietary tool, Integration, GHG Policy
- PLEXOS Solutions LLC
 - State-of-the-art production simulation model
- Schiller Associates, Steven Schiller Lead
 - Advisor on California GHG policy and energy efficiency
- Dr. Ben Hobbs, Johns Hopkins University
 - Academic advisor, World-renowned electricity simulation expert
- Dr. Yihsu Chen, UC Merced
 - Academic advisor, Emerging capability at UC Merced

 Energy and Environmental Economics, Inc.

3

Project Overview

- Joint CPUC, CEC, ARB effort to evaluate AB32 compliance options in California's electricity and natural gas sectors
- Model estimates the cost and rate impact of a variety of compliance strategies relative to two reference cases
- Project timeline designed to fit into 2008 Scoping Plan process for AB32
- Deliverables
 - Non-proprietary, transparent, spreadsheet-based model using publicly available data
 - Report on results and sensitivities / scenarios
 - Stakeholder process leading to CPUC/CEC proposed decision
 - Model output to be used as an input to the ARB economic models

 Energy and Environmental Economics, Inc.

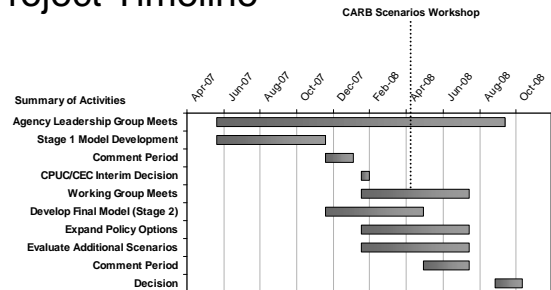
4

Two Stages

- Stage 1 (through 2/08): Impacts on Statewide Electricity and Natural Gas Sector
 - Develop data, methodology and test analysis tool
 - Informs CPUC/CEC February 2008 interim decision on electricity and natural gas GHG sector targets for 2020
 - Stakeholder comments / reply comments January 2008
 - Revisions to Stage 1 results following stakeholder comments
- Stage 2 (12/07 – 8/08): Impacts on LSEs
 - Allocation of GHG permits or auction revenues among LSEs
 - LSE-specific rate and cost impacts of different policy approaches
 - Cross-sector trading issues
 - Informs CARB June 2008 decision for 'burden sharing' of GHG reductions among all CA sectors and future decisions on allocation of GHG permits within the electricity sector

5

Project Timeline



6

Stage 1 Key Qs

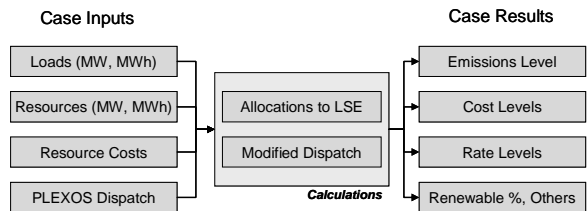
- How much will various policy options reduce CO2 emissions?
- How will these policy options affect electricity rates?
- *Underlying question: At what electricity sector target level do incremental improvements get expensive?*

Stage 2 Key Qs

- What is the cost to California of complying with AB32 under different policy options for the electricity sector?
- What is the cost to different LSEs and their customers of these options?
- *Underlying question: What option has the best combination of cost, fairness and enforceability?*

7

E3 GHG Calculator Approach



8

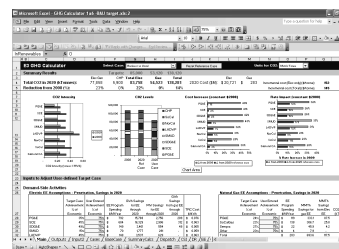
Modeling Progress

- Preliminary Stage 1 Results Delivered
 - Public Kick-off Meeting at CPUC, Sept. 21st
 - Stage 1 Methodology Presented at CPUC Workshop, Nov. 14th
- PLEXOS Model Runs Complete
- Stage 1 GHG Calculator Delivered
- Stakeholder Comments
 - Opening Comments Submitted Jan. 4th
 - Reply Comments Submitted Jan. 18th
- Stage 2 Beginning

9

GHG Calculator

- Based in Excel
- Uses only publicly available data
- Calculates scenarios rapidly
- Non-proprietary



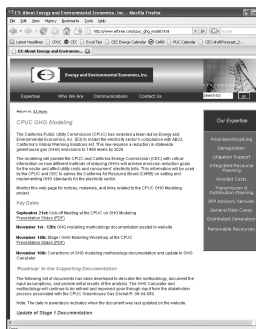
10

Next Steps

- Model improvements incorporating stakeholder comments
- Model allocation or auction of GHG permits in electricity and natural gas sectors
- Model impacts of offsets/cross-sector trading on compliance in electricity and natural gas sectors
- Sensitivity Analyses
 - Load growth forecast, costs of renewable energy and EE, etc.
- Coordination with ARB modeling

11

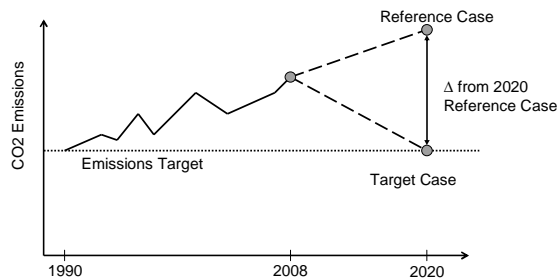
Highlights of Modeling Progress



- Project Website
- Workshop updates & past presentations
- Calculator available for download
- Documentation of methodology and inputs
- www.ethree.com

12

Measuring CO2 Change from Reference to Target Cases



13

Energy and Environmental Economics, Inc.

2020 Reference Cases

Policies	Business-as-Usual	Aggressive Policy
Renewable Energy	20% RPS (7,404 MW)	33% RPS (16,119 MW)
Energy Efficiency	"BAU" energy efficiency embedded in CEC load forecast (~35% economic potential)	100% of economic energy efficiency potential achieved
California Solar Initiative and Demand Response	1,091 MW of PV installed 5% demand response	3,000 MW of PV installed 5% demand response
GHG Emissions	170 MMTCO ₂ e	138 MMTCO ₂ e

14

Energy and Environmental Economics, Inc.

Resource Options Modeled

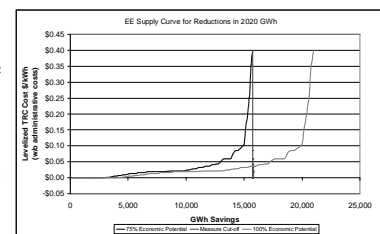
- Energy Efficiency by LSE
- Solar PV, Demand Response, Small CHP by LSE
- Large Scale Renewable Energy
 - Developed by zone
 - Developed by transmission size and configuration
- Large Scale Generation
 - Gas CCCT, Gas CT, Nuclear, Coal IGCC, Coal IGCC w/ CCS, Coal ST, Large CHP

15

Energy and Environmental Economics, Inc.

Energy Efficiency Supply Curves

- Created 7 LSE-specific EE supply curves of economic potential: relating energy savings to levelized total resource cost
- Data available from 2006 Itron EE potential studies



- Itron data available for 3 IOUs and SMUD. Relied on AB 2021 filings for POU economic potential and 2016 EE targets to scale EE supply curves to the POUs

16

Energy and Environmental Economics, Inc.

Renewables Modeled by Zone

- User selects transmission capacity to each zone
- Calculator estimates costs of renewables
 - ☐ Busbar cost
 - ☐ Transmission
 - ☐ Integration
 - ☐ Firming

Incremental Generation to California 2008 to 2020
Renewable resources by transmission cluster

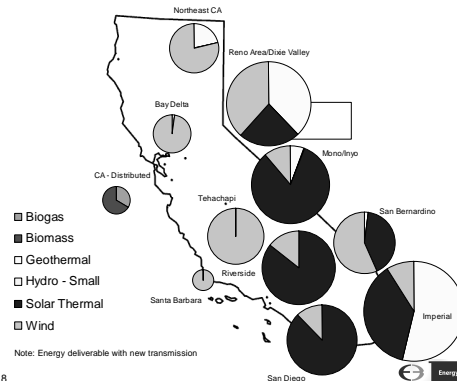
	Total Renewable Resources (MW)	Reference Case MW	User Selected MW
1 Alberta	6,000	-	-
2 Arizona-Southern Nevada	6,000	-	-
3 Bay Delta	2,991	-	-
4 British Columbia	4,429	-	-
5 CA - Distributed	900	-	2,000
6 CFE	5,000	-	2,250
7 Colorado	6,000	-	-
8 Geyers/Lake	719	-	220
9 Imperial	6,000	2,500	4,000
10 Mono-Inyo	6,000	-	220
11 Montana	6,000	-	-
12 NE NV	1,487	-	-
13 New Mexico	6,000	-	-
14 Northeast CA	3,194	-	1,000
15 Northwest	6,000	400	-
16 Reno Area/Delta Valley	6,000	-	2,500
17 Riverside	6,000	-	2,000
18 San Bernardino	6,000	-	2,000
19 San Diego	6,000	-	750
20 Santa Barbara	576	-	-
21 South Central Nevada	6,000	-	-
22 Tehachapi	6,000	4,500	4,500
23 Utah-Southern Idaho	6,000	-	-
24 Wyoming	6,000	-	-

Screen 'capture' from GHG Calculator



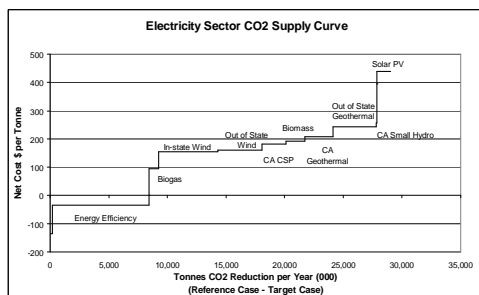
17

CA Renewable Resource Zones



18

Example CO2 Reduction Portfolio Reductions from BAU Reference Case



19



Thank You
Any Questions?

